

ECEY 5005/C Awe and Wonder – science, mathematics and the outdoors.

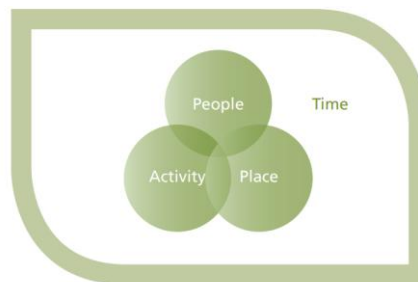
Part 1:



Source: Newman (2023)

Part 2: 1463

There are many recognised benefits to learning in the outdoor environment. Welsh Government (2022a) states that being outdoors allows children to explore their surroundings and create a sense of belonging which enhances wellbeing. Furthermore, Welsh Government (2023a) states that fostering a sense of belonging and “Cynefin” is paramount to all settings. This is supported by National Literacy Trust (2022) who state that regular participation in hands on outdoor learning opportunities improves children’s confidence and morale. Despite this, Louv (2019) states that children are less drawn to nature and introduced the term “Nature Deficit Disorder” stating that educators place less emphasis on the importance of nature. However, Education Scotland (2009a) state that the environments in which children learn help them to make sense of what they know. They go on to state that children will thrive with the right environment, with practitioners who support their learning and engaging activities, which is also the view of Welsh Government (2023b) with the three enablers.

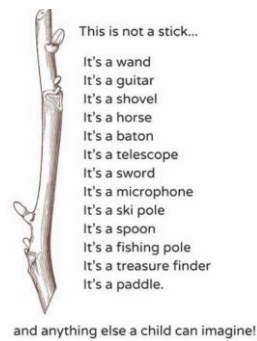


Source: Education Scotland (2009a)

Furthermore, Welsh Government (2022a) also states that the outdoors provides a wealth of authentic cross-curricular learning opportunities. The pictures outdoor environment presents a wealth of outdoor learning opportunities including:

- Physical development – developing their gross motor skills through investigation of the mounds and uneven terrain, enhancing fine motor skills by grabbing and collecting natural resources from the ground and surrounding foliage. Movement in many forms around the outdoor environment allowing children to explore.
- Creativity – through investigation of natural sounds that could introduce musical patterns, for example drumming with sticks, bark rubbing to create art or observational drawings to introduce mark making.

Within the outdoor environment children can develop to become creative, ethically informed, ambitious, capable, healthy and confident learners due to the outdoors sparking curiosity and investigation and hands on experiences of phenomena and theories, with a treasure trove of open ended, natural resources to hand (Welsh Government, 2022a). This is supported by Welsh Government (2023a) who state that children require opportunities for open-ended environments which enthuse exploration and investigation to enable them to develop.



Source: Brookes_family_day_care (2019)

The poem above describes how a child is able to use a stick to fulfil a number of tasks, on one day it may be a measuring stick to measure the mound in the photograph, using non-standard units of measure. The next day the same stick may be a part of a ramp to transport other loose parts from the top of one mound to the other. This illustrates the open-ended nature of the outdoors, and the play that can enable learners to problem solve, perhaps with the support of peers and enabling adults. This is supported by Boulton and Thomas (2022) who discuss Nicholson's theory on loose parts and their ability to spark curiosity, exploration and investigation, leading to knowledge and understanding.

Within the pictured environment there are opportunities for children to explore the mathematical concepts of collecting and classification or sorting. Welsh Government (2020), within their progression steps, Welsh Government (2022a) within its exploration development pathway and Education Scotland (no date) place an importance on early sorting and classification. This allows children to explore their findings which allows children to also develop skills in data handling. Furthermore, Skinner and Dancer (2012) state that the usual classroom resources such as sorting bears are boring and unexciting for children and go on to state that fascinating collections such as natural objects allow for children to sort them into many more categories. This is supported by Welsh Government (2014) who state that natural collections are more fascinating. This could be collecting leaves of various sizes, species, colours and textures or perhaps collecting sticks, conkers, pinecones or acorns. These collections are then able to be sorted or classified – which are big or small, sort into colour, rough or smooth, long or short, bendy or rigid etc and use descriptive language which supports the children's knowledge and understanding. Keith (2018) states that there should be less emphasis on sorting items into colour or size and it could be argued that the outdoors provides resources with texture, weight and many other ways in which they may be classified. Welsh Government (2014) suggests adding resources which support the sorting process, for example boxes or hoops to allow children to see visually how they are sorting their collections and make changes as they investigate. It may be beneficial to add paper and pencil to allow children to investigate the items collected further, such as leaf rubbing or drawing around the conkers, this would allow for discussions about their shape, size or texture "Is this leaf bigger than the last one?" "Look at all the marks you've made with this leaf, why do you think there are more lines?" This could support the children's ability to classify and sort the items collected.



Source: Zunic (2023)

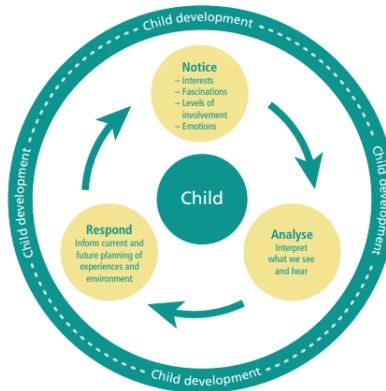
Additionally collecting and sorting allows for links to number and one-to-one correspondence allowing children to “play with quantities and numbers” (Welsh Government, 2022a) therefore the addition of mark making materials as well as tactile numbers may enhance this exploration.

Keith (2018) suggests that reading books related to the mathematical concept being explored can help children to further understand their learning and therefore stories relating to sorting and classifying may encourage this such as “It’s a seashell day” by Dianne Ochiltree, which will encourage vocabulary such as lumpy, bumpy, shiny as well as counting. Additionally, Keith (2018) states that linking exploration and learning to rhymes focuses the learning. Froebel also noted the benefits of songs and rhymes in enabling children to make sense of the world around them (Dyke, no date). Therefore, an enabling adult in this scenario may create a rhyme or song to draw the children into their sorting or classification, for example “This is the way we sort the pinecones” to the tune of here we go round the mulberry bush.

Tunncliffe (2015) states that early science begins with play, exploration and problem solving and that this scientific learning may not be able to be communicated with the adults as the children may not yet have acquired the correct vocabulary to do so. As such it is important that we provide children with the opportunity to explore as well as the vocabulary, through metacognitive talk and sustained share thinking. This is evident within Welsh Government (2022b) within their statements of what matters where they state:

“Curiosity about science and technology leads us to ask questions about the world around us. By being encouraged to use logic, evidence and creativity, learners will be supported to inquire into and apply scientific knowledge to further understanding of how our world works”

The photographed environment also allows for exploration and development of the senses in a meaningful, authentic context (Welsh Government, 2021) and in doing so children will experience balance and physical development too. White (2013) suggests that being outdoors provokes a wider range of movement and that movement develops a child's sense of self. Furthermore, Ryder Richardson (2013) and Oxfordshire County Council (no date) acknowledge the many benefits of the outdoor environment in providing a multi-sensory space with freedom that cannot be recreated indoors. Being outdoors also offers the opportunity to explore these senses throughout the seasons and weathers (White, 2013 and Johnson and Watts, 2019) This allows children to question “will I roll faster when the mound is wet?” and “what will happen now that it is covered in snow?”.



Source: Welsh Government (2022a)

Johnson and Watts (2019) place importance on adults who extend learning by responding appropriately, with answers that will ignite curiosity rather than a closed statement. This is supported by Tovey (no date) who states that practitioners should engage in sustained shared thinking to encourage the children to speculate and wonder with open ended questioning for example “I wonder how the snow feels?” Additionally, White (2016) states that these cannot be developed without doing, they will not be learned through talking and listening, children require hands on experiences to develop an understanding of balance. This information should then be used to inform future planning based around the interests of the child and practitioners' interpretations during observations, as suggested in Welsh Government (2022a).

White (2013) suggests that growing is an impactful way for children to learn not only about life cycles but also about their senses. The sights and smells of the flower, herb or vegetable, the touch of the soil and seeds, the sounds as we water them. There are many meaningful discussions around senses to be had from the addition of some planters and equipment for gardening here. It goes without saying that these activities could also be linked to many other development pathways, for example physical development (by exercising fine and gross motor skills while caring for the plants) and mathematical development (counting the seeds/leaves/petals, measuring the height/water).

Part 3: 1061

RISK BENEFIT ASSESSMENT

Location / Activity:	Woodland	Date:	19.09.23
Assessor:	Hannah Newman	Review date:	06.11.23

Experience exploring outdoor space in photograph	How will young people BENEFIT from this activity?	Hazards and associated risks	Who is at risk ?	PRECAUTIONS in place to reduce the risk of injury	Overall risk after precautions RATING: L/M/H
Ascending and descending mounds.	Children experience vestibular sense and proprioception by ascending and descending mounds and experiencing spatial awareness and improve their balance and coordination, while also improving their core strength.	Tripping or falling on the mounds. Grazes, splinters or bruising, broken bones, and head injury. Collisions with other children.	Children and adults	Adults surveying the area to look for any hazards such as large branches. Children to wear appropriate footwear and clothing. Conversations with the children to encourage safe ascension and descension, making sure that children know the safety rules – for example limitations to the number of children that can safely be on the mounds at one time, being aware of others around them and the area at the bottom of the mounds before commencing descent, being aware of others who may be descending the mound. Making their own informed judgements. First aid kits available and administered by qualified practitioners in case of minor grazes or splinters and parents to be informed, following the correct recording procedure. Any major head injury or suspicion of broken bones to be sent to hospital.	Medium
Exploring the environment	Adults need to retain children's awe and wonder – being outdoors sparks curiosity. This can lead to holistic learning through play and discovery. Being outdoors also	Slips, trips and falls due to uneven ground, exposed tree roots and stones/branches. Child encountering	Children	Children to wear appropriate footwear and clothing. First aid kits available and administered by qualified practitioners in case of minor grazes or splinters and parents to be informed, following the correct recording procedure. Adults surveying the area to look for any hazardous litter and disposing of this safely. Safety talk with children	Low

	benefits wellbeing. Opportunity for children to learn how to be safe in the outdoor environment.	hazardous litter. Child ingesting toxic plantation and contact with brambles, stinging nettles and thorny plantation. Contact with insects/bugs and other wildlife. Lack of physical boundaries around the area enabling children to wander off. Child getting lost. Uneven surfaces. Members of public entering site.		around not touching rubbish, making sure that if the children are not sure if it is rubbish that they ask an adult first. Discuss the safety around not putting anything in their mouths and needing clean hands before eating snack etc to avoid toxins and discuss plants that sting or have thorns with children and ensure first aider and first aid kit is available in case of accidents. Practitioners to survey area and identify toxic plantation prior to sessions to enable safety. Ensuring children are aware not to approach wildlife or become hands on without an adult present. Remaining within legal ratios and ensuring children are present by head counting. Making sure that there are safety rules in place and ensuring children are aware of the rules and the boundaries on a regular basis. Ensure there is a setting missing child policy and procedures in place. Ensure that children are aware of stranger danger, not to approach anyone not within the settings staff and that staff are vigilant, and surveying the area, constant direct supervision of children and environment.	
Handling natural collections	Mathematical development, curiosity, exploration, and investigation. Creative development.	Rubbish, broken glass, dog fouling or other animal mess, and other hazardous items on site. Splinters, thorns, bumps, cuts and grazes.	Children and adults.	Ensuring that the area is thoroughly cleared of hazardous items, safely using protective equipment such as litter pickers and sharp boxes. If hazardous items are found that cannot safely be disposed of in time for children's arrival the area must not be used. Children to be aware to NEVER touch any of these hazardous items as part of their safety rules, making sure that if the children are not sure if it is rubbish that they ask an adult first. First aid to be provided in case of minor grazes or splinters and parents to be informed, following the correct recording procedure. Any major head injury or suspicion of broken bones to be sent to hospital.	Low

Exploring the environment through out the seasons and weather conditions.	Children benefit from hands on experiences with their senses to develop their knowledge and understanding in authentic contexts. Develop awareness of weather conditions and becoming healthy and confident.	Hot days – heat/heat stroke, sun burn Chilly days, snow, and ice – slips, falls, hypothermia. Wet days- slippery surfaces, slips and falls.	Children and adults.	Be aware of weather forecasts. In the event of extreme weather or weather warnings make alternative arrangements. Ensure that the correct clothing is worn: Layers for cold and wet days. Using hats, scarfs, gloves, wet weather gear when appropriate. Appropriate footwear. Warm weather ensure that sun hats, sunscreen and long sleeves are worn to shelter from the sun. Provide shelter for escape from heavy downpours or sun, avoiding direct sunlight at hottest part of the day. Ensure access to sufficient drinking water. First aid kits available and administered by qualified practitioners in case of minor slips and falls and parents to be informed, following the correct recording procedure. Any major head injury or suspicion of hypothermia to be sent to hospital.	Medium
Climbing trees	Mathematical development – non units of measure, height, and estimation. Physical development – balance, vestibular sense, gross motor development. Use of senses. Learning to assess own risks. Develop confidence and resilience.	Falls, cuts, grazes, head injury. Breaking branches – potential hazards to others on site.	Children and adults.	Safety talks with children to ensure they are aware of how to be safe while climbing and make informed judgements. Make sure that children are aware of any limitations regarding how high they are allowed to climb or trees which should not be climbed. Wearing suitable footwear and clothing for the activity. Staff inspection of the environment to ensure no unstable trees or branches that may fall. Staff to supervise children when climbing. First aid kits available and administered by qualified practitioners in case of minor falls, cuts and grazes and parents to be informed, following the correct recording procedure. Any major head injury to be sent to hospital.	Medium

Part 4: 1851

Welsh Government (2023a) states that children are curious learners who have an innate desire to explore their surroundings and places an emphasis on adults to offer environments which are stimulating, interesting and engage children in exploration while allowing children the opportunity to develop by getting it wrong and trying again. This is also the view of Education Scotland (2017) who state that children should be left to investigate and allow the children to be hands on by themselves, remembering that they are capable learners. Moreover, Welsh Government (2022a) state that the outdoor environment triggers engagement. Therefore, access to outdoor environments is vital to cognitive development and practitioners should facilitate this. This is supported by Education Scotland (2022) within their case study, which states that increased participation was observed when outdoor learning was embedded.

Moreover, Welsh Government (2020) argues the importance of teaching mathematics and numeracy in a stimulating and engaging manner with an importance placed on play to develop exploration and problem-solving skills. Additionally Welsh Government (2022b) explores the connection between mathematical and scientific thinking and the importance of becoming ethically informed citizens, highlighting the need for enabling practitioners, effective environments and engaging experiences (Welsh Government, 2023b). It is also important to note that Welsh Government (2021) supports the scientific learning available in the outdoor environments. Tovey (no date) also supports this and states that learning in the outside world is cross-curricular through authentic experiences which can be linked to areas of learning by knowledgeable practitioners. Despite this, Bilton and Waters (2016) study argues that practitioners place little value on outdoor experiences on children's exploration and experimentation outdoors, as of the 110 responses only 7 cited this as an aim for outdoor experiences, which highlights the need to further the understanding of practitioners around the educational benefits of the outdoors.

Vygotsky valued the brain development which occurs during play as well as the value of a more knowledgeable peer or practitioner (Johnston and Nahmad-Williams 2014). Tunnicliffe (2015) states that early science begins with play, exploration and problem solving and that this scientific learning may not be able to be communicated with the adults as the children may not yet have acquired the correct vocabulary to do so. As such it is important that we provide children with the opportunity to explore as well as the vocabulary, through metacognitive talk and sustained share thinking. This is evident within Welsh Government (2022b) within their statements of what matters where they state:

"Curiosity about science and technology leads us to ask questions about the world around us. By being encouraged to use logic, evidence and creativity, learners will be supported to inquire into and apply scientific knowledge to further understanding of how our world works"

Additionally, this is supported by Welsh Government (2022a) which values scientific and mathematical development through play, exploration and hands on experiences of phenomena and theories, that children will develop their knowledge and understanding of the world around them. This can also be linked to the view of Froebel who believed that children were curious learners who learn through a hands-on experience following their interests and desire to explore and placed a great value on time in nature and the importance of developing an understanding of the connection between all living things, which is best done outdoors (Tovey, 2012). Additionally, this is closely linked to Pestalozzi's theory that children learn with engagement in active learning (Sellars and Imig, 2021.)

Waters and Rekers (2019) considers the barriers to children learning in the outdoor environment when the adults supporting them are opposed to risky play or have a lack of understanding regarding the abilities of children to assess the risks for themselves and the benefits in allowing them to do so. This can lead to children becoming fearful of new challenges and hinder the development of healthy, confident children. Therefore, it is important that practitioners value the learning which occurs outdoors through trial and error and understand the benefits of risky play, allowing children to become healthy, confident and capable learners. Ryder Richardson (2013) also acknowledges the importance of supportive and enabling adults whom themselves acknowledge the benefits of the outdoors and goes on to state that adults

should show real interest in the children's achievements and scaffold their learning with meaningful discussions and sustained shared thinking.

Moreover, Johnson and Watts (2019) suggest that practitioners who engage in playful moments by modelling can inspire children to explore further, therefore it is important that practitioners know when demonstration can extend the teachable moments in play with sustained shared thinking. This can be linked to Vygotsky's theory on zone of proximal development, which suggests that children learn from interactions with knowledgeable peers or practitioners (Anning, Cullen and Fler, 2009). Similarly, Tovey (no date), Siraj-Blatchford and MacLeod-Brudenell (2003) Davies *et al* (2014) and Welsh Government (2014) state the importance of effective questioning by asking open-ended who, how, what questions and allowing the children to further their thinking. Anning, Cullen and Fler (2009) explain that questioning in such manner allows for co-construction of knowledge. It is essential that these questions relate to the child's flow of thought and so then this also places an importance on practitioners to effectively observe the children's knowledge and understanding. Furthermore, this is supported by Welsh Government (2008) and Welsh Government (2021) who argue the importance of timing any interruptions. It is important to ensure interruptions extends the experience and does not interrupt the flow and they suggest several cues to this, including risk outweighing the benefit with play becoming too risky or aggressive, being invited and frustration or a plateau.

Additionally, Davies *et al* (2014) suggests open questioning also supports children to process their learning and understanding and acts as a tool for observation for practitioners. Similarly, Waters and Rekens (2019) state that with enabling adults and practitioners who understand that children learn through play-based pedagogy and following the children's interests, it is possible to extend curiosity and observe teachable moments within play. Therefore, there is a duty to practitioners to ensure child-centered practice and that effective observations are recorded which is also the view of Welsh Government (2014) and Welsh Government (2022a). Moreover, Topçiu and Myftiu (2015) state that observations enable practitioners to identify current knowledge and to develop planning that supports learning in next steps within Vygotsky's zone of proximal development through quality interactions with a more knowledgeable peer or practitioner.

Thomas and Jones (2021) discuss the benefits to child development and knowledge and understanding when practitioners plan following the child's schematic exploration. Such schema may be noted during observations. This is also discussed by Nutbrown (2011) who states that there are many scientific and mathematical concepts that can be explored through schema in the outdoor environment, for example sand play linked to containing or enveloping schema and its development of knowledge around capacity. Additionally, straight line schema can be linked to learning around length and non-standard units of measure. This demonstrates the value of observation, as practitioners will be able to plan effectively when they have a thorough understanding of the child's interests.

Ryder Richardson (2013) supports outdoor environments which offer children versatility and flexibility to empower children to take charge of their learning. This links to Nicholson's loose part theory who argues that experimentation and curiosity, and therefore learning opportunity to children, can be prolonged with the addition of loose parts, in addition to the environment itself also offering many flexibilities (Mackinder, 2023). Similarly, Brown (2003) places great value on a flexible environment to encourage the development of problem solving and creativity. This is also explored in Rahardjo's (2019) qualitative study, where the focus group discussion found that adding loose parts supported mathematical development and sparks imagination and observation skills. Furthermore Brown (2003) discusses this development as being a self-fulfilling cycle of development, whereby flexibility affords risk and problem solving as well as confidence to be resilient and perseverance. This is additionally supported by Early Years Matters (2023) who state that outdoor experiences improve problem-solving skills and develop confidence. Additionally, Boulton and Thomas (2022) place high regard to loose parts in the outdoor environment in order to increase learning opportunities. Whilst loose parts may be gathered, such as sticks and leaves, conkers and pinecones, Boulton and Thomas (2022) state that the addition of man-

made loose parts such as tyres and drainpipes can extend the learning opportunities for example rolling and exploring gravity/motion. The loose parts theory is closely linked to play affordances as discussed in Flannigan and Dietze's (2018) study which states that the outdoor environment itself can be open ended as well as the open-ended nature of loose parts, and practitioners should acknowledge the learning potential of an environment itself, as well as with the addition of play affordances. The affordance theory places an importance on the environment to be open ended and inviting by providing a variety of large and small loose parts, but also keeping in mind that a child's interests, schemas and prior knowledge may influence how they interact with these (Early years educator, 2016). Therefore, practitioners could support this in practice by observing their setting and ensuring that resources are open ended, accessible and spark curiosity and exploration. One example could be to add water and drainpipes to the outdoor environment. Of course, it is possible for children to explore and experience water in the outdoor environment through the weather, or with natural bodies of water for example at the seaside or lakes and ponds, however water can be added on large scale where it not naturally accessible also. This allows children to move the water around the environment, discover how water changes the ground, what happens when water is poured down ramps, investigate volume and capacity, concepts such as floating and sinking and explore their senses through water (White, 2013). Therefore, enabling environments need to be assessed and facilitated by practitioners through interpretation of children's current understanding and knowledge and providing opportunities to extend learning (Welsh Government 2021).

An additional role of an enabling adult may be to provide appropriate outdoor clothing (Welsh Government, 2014). The lack of suitable outdoor clothing to enable access to the outdoors, even during wet or cold weather, can be seen as a barrier to accessing the outdoor environment, as discussed in Learning through landscapes (2023). It is also important to consider that outdoor clothing may be too costly for some families and as such settings may need to consider having a stock of these items as well as spare clothes in case of mishaps (Learning through landscapes, no date). This links to the requirement for children to feel warm, safe and have shelter as within Maslow's physiological and safety needs before they are able to meet their full potential (Holzknecht, 2007). It is important to note the Scandinavian traditions for children to spend longer periods outdoors than indoors, embedded in their cultural heritage of *friluftsliv*, which can be translated to outdoor life (Knight, 2012). As this area has a much colder climate than the UK it is important that practitioners do not use the inclement weather as an excuse not to access the outdoors.

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